

WHAT IS CLAIMED IS:

1. A liquid detecting apparatus comprising a liquid detecting element disposed at a lower end of a vibration shaft and immersed in a measuring liquid, and a vibrating element disposed at an upper end of said vibration shaft and for vibrating said vibration shaft in a circular direction about an axis thereof, wherein a plurality of piezoelectric vibrating plates, which each contact a bending vibration, are used as said vibrating element and axially symmetrically arranged in the axial direction with respect to said vibration shaft so that said piezoelectric vibrating plates conduct a bending vibration, lower vibrating ends on the liquid detecting element side of said piezoelectric vibrating plates are rigidly connected (vibration suppressing connection) to a vibration suppressing member and inner ends of upper vibration ends on the opposite side to said liquid detecting element of said piezoelectric vibrating plates are rigidly connected (vibration connection) to said vibration shaft, an inner end edge of each of said piezoelectric vibrating plates excluding the vibration connection part is held free with respect to said vibration shaft, a bending vibration at the lower vibrating end of each of said piezoelectric vibrating plates is suppressed on the vibration suppression connection part side and a bending vibration at the upper vibrating end is amplified, the amplified bending vibration at each vibrating end is applied to said vibration shaft and said liquid detecting element through the vibration connection part, so that said liquid detecting element is vibrated in the circular direction in said measuring liquid.

2. A liquid detecting apparatus comprising a liquid detecting element

disposed at a lower end of a vibration shaft and immersed in a measuring liquid, and a vibrating element disposed at an upper end of said vibration shaft and for vibrating said vibration shaft in a circular direction about an axis thereof, wherein a plurality of piezoelectric vibrating plates, which each contact a bending vibration, are used as said vibrating element and axially symmetrically arranged in the axial direction with respect to said vibration shaft so that said piezoelectric vibrating plates conduct a bending vibration, a cylindrical member serving the vibration axis for connecting the inner end edges of said piezoelectric vibrating plates as an axis thereof is provided, each of said piezoelectric vibrating plates is externally inserted in an upper end of said vibration shaft at said cylindrical member, lower vibrating ends on the liquid detecting element side of said piezoelectric vibrating plates are rigidly connected (vibration suppressing connection) to a vibration suppressing member and inner ends of upper vibration ends on the opposite side to said liquid detecting element of said piezoelectric vibrating plates are rigidly connected (vibration connection) to said vibration shaft, an inner end edge of each of said piezoelectric vibrating plates excluding the vibration connection part is held free with respect to said vibration shaft, a bending vibration at the lower vibrating end of each of said piezoelectric vibrating plates is suppressed on the vibration suppression connection part side and a bending vibration at the upper vibrating end is amplified, the amplified bending vibration at each vibrating end is applied to said vibration shaft and said liquid detecting element through the vibration connection part, so that said liquid detecting element is vibrated in the circular direction in said measuring liquid.

3. A liquid detecting apparatus according to claim 1 or 2, wherein a through-hole serving the vibration axis as an axis thereof is formed in said vibration suppressing member, said vibration shaft is inserted in said through-hole and said piezoelectric vibrating plates are rigidly connected to said vibration suppressing member on a radial line of said vibration suppressing member.